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ABSTRACT

Anxiety is defined as the fear of the unknown. The construct of anxiety incorporates both psychological and physiological components. This study was designed to explore the association between psychometric results and physiological results. The association between perceived effects (i.e., psychological) and actual effects (i.e., physiological) of both helpful and disruptive testing cues also was explored. Nineteen high test anxious (HTA) and seventeen low test anxious (LTA) undergraduate students served as subjects. Statistical results obtained suggest that a difference exists for systolic blood pressure and arterial pulse rate between HTA and LTA subjects. Only the systolic blood pressure revealed a main effect for the treatment (i.e., disruptive and helpful testing cues). Although no treatment main effect was found for arterial pulse rate, results obtained for that measure were in agreement with the predicted values. That is to say, pulse rate was the greatest after the disruptive cues and the lowest after the helpful cues. Pulse rate was reduced after each of the relaxation sessions. Results of comparisons between perceived effects and actual effects revealed a definite association between psychological and physiological response to disruptive and helpful testing cues. As predicted, a signifiant correlation existed among all treatments. Once again, the implication is that if an individual's autonomic responses were elevated they would remain elevated, although the group, both HTA and LTA, fluctuated in response to those treatments. (Author)

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PHYSIOLOGICAL IMPLICATIONS OF TESTING CUES: A PROFILE OF TEST ANXIOUSNESS

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PHYSIOLOGICAL IMPLICATIONS OF TESTING CUES:
A PROFILE OF TEST ANXIOUSNESS

Anxiety can be defined simply as fear of the unknown. The construct of anxiety incorporates both psychological and physiological components. Psychological manifestations of anxiety are worry, tension and nervousness. Physiological manifestations of anxiety are increased perspiration, respiration and heart palpitation. Coates and Thoresen (1976) indicated that the construct of general anxiety presents major problems of definition, measurement and interpretation. Coates and Thoresen state that general anxiety is a multidimensional interaction of person, situation and specific response. Suinn (1965) reported that students who experience high levels of general anxiety also experience high levels of test anxiety.

This study is a continuation of the research reported by Kermis (1982) who investigated a situation specific anxiety (i.e., test anxiety). In an attempt to control those problems identified by Coates and Thoresen, direct observations (i.e., blood pressure and pulse) were obtained for subjects responses to disruptive and helpful testing stimuli. The results of that study were as follows: 1) development of a relaxation technique, 2) development of imagery techniques for helpful and disruptive treatments and 3) development of direct observations for autonomic responses.

This study incorporated both the design and the methodology reported by Kermis (1982). Objectives of this study were threefold. First, subjects autonomic responses for helpful and disruptive treatments were obtained. Second, a comparison was made between physiological responses and psychological responses. Third, a comparison was made between physiological responses and scores on a psychometric scale for measurements of anxiety.

Conceptual Bases of the Research

Kermis and Schafer (1982) interviewed subjects to determine how students viewed a test. Subjects responses consisted of 55 items that were under the control of the educational system. Twenty-eight were perceived as being disruptive to test performance and twenty-seven were perceived as being helpful to test performance. Kermis (1983) queried a random sample (n = 133) of undergraduates for both the intensity and frequency of their responses to those 55 items. Seventeen "potent" testing cues were identified. "Potent" is implied to mean a 90 percent agreement among subjects' responses for both intensity and frequency. Based on the results of those studies the assumption was made that only the psychological component of test anxiety that is worry, tension and nervousness was explored. Kermis (1982) used those seventeen cues and three additional cues to determine if evidence existed to support the postulate that those "potent" testing cues were also associated with the physiological component of test anxiety. Results of the pilot study (Kermis, 1982) confirmed the appropriateness of both the design and method, as well as an association between testing stimuli and physiological responses.

The design of this study was a replication of that reported by Kermis (1982). Both imagery and relaxation training were used in this study. Blood pressure and pulse were obtained as measures of subjects physiological responses to both disruptive and helpful testing stimuli.

Several postulates were formulated prior to the start of the study. Currently, psychometric scales are the only valid measure for determining an individual's level of anxiety. Test anxiety is believed to consist of two components (i.e., psychological and physiological). Paper and pencil

measures of test anxiety are an estimation of how people believe they would respond. There has been no valid measure reported for the assessment of actual responses. The assumption was made that the measure used in this study (i.e., A-Trait scale of the STAI) was a valid psychometric measure of anxiety. Also, the assumption was made that those testing cues were valid. Therefore, an association should exist between the psychometric results obtained and the physiological results obtained. Furthermore, there should be an association between the perceived effects of those testing cues (i.e., psychological) and actual effects of those testing cues (i.e., physiological).

Method

Subjects

A random sample of thirty-six males and females served as subjects. Nineteen subjects were high test anxious (HTA) and seventeen subjects were low test anxious (LTA). All subjects were currently enrolled in either undergraduate or graduate courses. Data collected on ten cases were discarded due to equipment failure.

Materials and Apparatus

The A-Trait scale of the State-Trait Anxiety Inventory (STAI) developed by Spielberger, Gorsuch and Lushene (1970) is a self-report measure that is designed to measure an individual's propensity to be anxious. The Test Cue Inventory (TCI) developed by Kermis (1981) is a self report measure that is designed to measure an individual's written introspective feelings about disruptive and helpful testing cues. A relaxation technique and imagery training used in this study were developed by Kermis (1982).

Systolic and diastolic blood pressure were obtained using a model DS-102 computer. Arterial pulse was also obtained using a DS-102 computer. Those three parameters were recorded simultaneously.

Procedure

The procedure described below was identical for each subject in the experiment. Subjects completed the biographical information card (e.g., name, height, etc.). Subjects were then asked if they had ingested anything that would alter their normal physiological functions (e.g., coffee, drugs, etc.). Consideration was given to the anotomical and physiological predisposition of the subject as sources of potential bias of the results (Mountcastle, 1980). Subjects were then asked to describe what happened to them in the last hour (e.g., car accident, test, etc.). Subjects were then asked to sit back in a comfortable chair and roll up their left sleeve. The brachial artery was located by pressing two fingers about 3 cm above the elbow on the inside of the arm (Mountcastle, 1980). The cuff was placed around the arm, making sure that the microphone was over the brachial artery. Subjects' blood pressure (systolic and diastolic) and pulse were recorded. These measures were used as the baseline of physiological functions. Subjects were then read the relaxation script. With the cuff still in place on the left arm the blood pressure and pulse were recorded a second time. These measures were used as the relaxed physiological functions. Subjects were then read the imagery script for the disruptive cues. Once again, at the completion of the script, their blood pressure and pulse were recorded. The procedure was then repeated for the helpful cues. Subjects were then asked to complete the STAI and to complete the TCI, respectively.

Results

Three ANOVA's for repeated measures were performed. Systolic blood pressure was significant for both treatments $F(4,170) = 3.23$, $p < .05$ and anxiety level, $F(1,170) = 4.19$, $p < .05$. A significant treatment x anxiety

Insert Table I

level interaction was not observed. Arterial pulse rate was significant for anxiety level, $F(1,170) = 3.66$ $p < .05$. A significant treatment main

Insert Table II

effect and a significant treatment x anxiety level interaction were not observed. A significant treatment main effect, anxiety main effect, and treatment x anxiety interaction were not observed for diastolic blood pressure.

Insert Table III

A Pearson product-moment correlation was performed between the treatments (i.e., baseline, relaxation -1, disruptive cues, relaxation -2 and helpful cues) for all autonomic responses (i.e., systolic and diastolic pressures and pulse). A significant correlation ($p < .05$) was obtained for the twelve correlations.

Insert Table IV

The final result obtained was a comparison between perceived effects of both disruptive and helpful testing cues (i.e., responses to the TCI) and actual effects of both disruptive and helpful testing (i.e., responses of systolic, diastolic pressures and blood pressure). Subjects for both the

Insert Table V

set of disruptive cues and set of helpful cues reversed on six responses out of 720 total responses. That is to say in six cases a cue was previously identified as either disruptive or helpful by students (Kermis & Schafer, 1982; Kermis, 1983), whereas subjects in this study perceived the cue as helpful or disruptive, respectively. Systolic pressure and arterial pulse for disruptive cues was above the same autonomic responses for helpful cues. In one case (i.e., diastolic pressure) the autonomic response for helpful cues was elevated .38 mm Hg above the same autonomic response for disruptive cues.

Discussion

Statistical results reported in the previous section suggest that a difference exists for systolic blood pressure and arterial pulse rate between high test anxious (HTA) and low test anxious (LTA) subject for both disruptive and helpful test cues. However, there were no interactions observed which implies that treatments did not differentially effect HTA and LTA subjects. Perhaps those differences observed were due to a predisposition associated with different anxiety levels. Only the systolic blood pressure revealed a main effect for the treatments. Systolic pressure decreased with each treatment. Perhaps subjects were more comfortable as the experiment progressed. Although no treatment main effect was found for arterial blood pressure, results obtained for that measure were in agreement with predicted values. That is to say, pulse rate was the greatest after the disruptive cues and the lowest after the helpful cues. Pulse rate was reduced after each of the relaxation sessions. Perhaps pulse rate is the autonomic response that should be used in future experiments.

Three potential design problems are currently under investigation. What effect does the initial equipment attachment have on subjects autonomic responses? How accurate is the classification of HTA and LTA subjects who have ingested either stimulants or depressants prior to the experiment? What effect, if any, does fatigue have on the responses of subjects?

Results of comparisons between perceived effects and actual revealed a definite association between psychological and physiological response to disruptive and helpful testing cues.

As predicted, a significant correlation existed among all treatments. Once again, the implication is that if an individual's autonomic responses were elevated they would remain elevated, although the group, both HTA and LTA, fluctuated in response to those treatments.

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TABLE I

Means and Standard Deviations for Systolic Blood Pressure

Systolic Conditions	N	$\bar{X}$(mmHg)	SD
Baseline	36	112.47	11.10
Relaxation-1	36	107.22	10.32
Disruptive Cues	36	106.39	10.13
Relaxation-2	36	105.08	10.76
Helpful Cues	36	104.42	10.83

TABLE II

Means and Standard Deviations for Arterial Pulse Rate

Pulse Conditions	N	$\bar{X}$(beats/min.)	SD
Baseline	36	72.28	12.63
Relaxation-1	36	70.50	12.09
Disruptive Cues	36	72.67	13.40
Relaxation-2	36	70.94	10.88
Helpful Cues	36	69.56	10.08

TABLE III

Means and Standard Deviations for Diastolic Blood Pressure

Diastolic Conditions	N	$\bar{X}$(mmHg)	SD
Baseline	36	69.14	10.87
Relaxation-1	36	70.03	13.17
Disruptive Cues	36	69.44	10.17
Relaxation-2	36	71.97	13.07
Helpful Cues	36	69.83	12.32

TABLE IV

Pearson Correlations Among Treatments for
Systolic (S), Diastolic (D) and Pulse (P)

	Baseline(S)	Relaxation(S)	Disruptive(S)	Relaxation(S)	Helpful(S)	Baseline(D)	Relaxation(D)	Disruptive(D)	Relaxation(D)	Helpful(D)	Baseline(P)	Relaxation(P)	Disruptive(P)	Relaxation(P)	Helpful(P)
Baseline(S)	1.000														
Relaxation(S)	.846*	1.000													
Disruptive(S)		.806*	1.000												
Relaxation(S)			.863*	1.000											
Helpful(S)				.913*	1.000										
Baseline						1.000									
Relaxation(D)						.710*	1.000								
Disruptive(D)							.834*	1.000							
Relaxation(D)								.712*	1.000						
Helpful(D)									.892*	1.000					
Baseline(P)											1.000				
Relaxation(P)											.845*	1.000			
Disruptive(P)												.787*	1.000		
Relaxation(P)													.867*	1.000	
Helpful(P)														.807*	1.000

* $p < .05$

TABLE V

Association Between Perceived Effects and
Actual Effects of Testing Cues

Number of Correct Responses for the TCI	Means for Systolic (S) Diastolic (D) and Pulse(P)
	Disruptive Cues
357 out of 360	$\bar{X}_S$ = 106.39 (mmHg)
	$\bar{X}_D$ = 69.45 (mmHg)
	$\bar{X}_P$ = 72.67 (beats/min.)
	Helpful Cues
357 out of 360	$\bar{X}_S$ = 104.41 (mmHg)
	$\bar{X}_D$ = 69.83 (mmHg)
	$\bar{X}_P$ = 69.56 (beats/min.)